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# CARLYLE RESERVOIR, BOND, CLINTON, AND FAYETTE COUNTIES, ILLINOIS

Pacific Northwest Environmental Research Laboratory

Prepared for:

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June 1975

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
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# NATIONAL EUTROPHICATION SURVEY
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# REPORT
# ON
# CARLYLE RESERVOIR
# BOND, CLINTON, AND FAYETTE COUNTIES
# ILLINOIS
# EPA REGION V
# WORKING PAPER No. 297

WITH THE COOPERATION OF THE
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
AND THE
ILLINOIS NATIONAL GUARD
JUNE, 1975

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# FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

## OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

## ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

## LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Illinois Environmental Protection Agency for professional involvement and to the Illinois National Guard for conducting the tributary sampling phase of the Survey.

Dr. Richard H. Briceland, Director of the Illinois Environmental Protection Agency; and Ronald M. Barganz, State Survey Coordinator, and John J. Forneris, Manager of Region III, Field Operations Section of the Division of Water Pollution Control, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

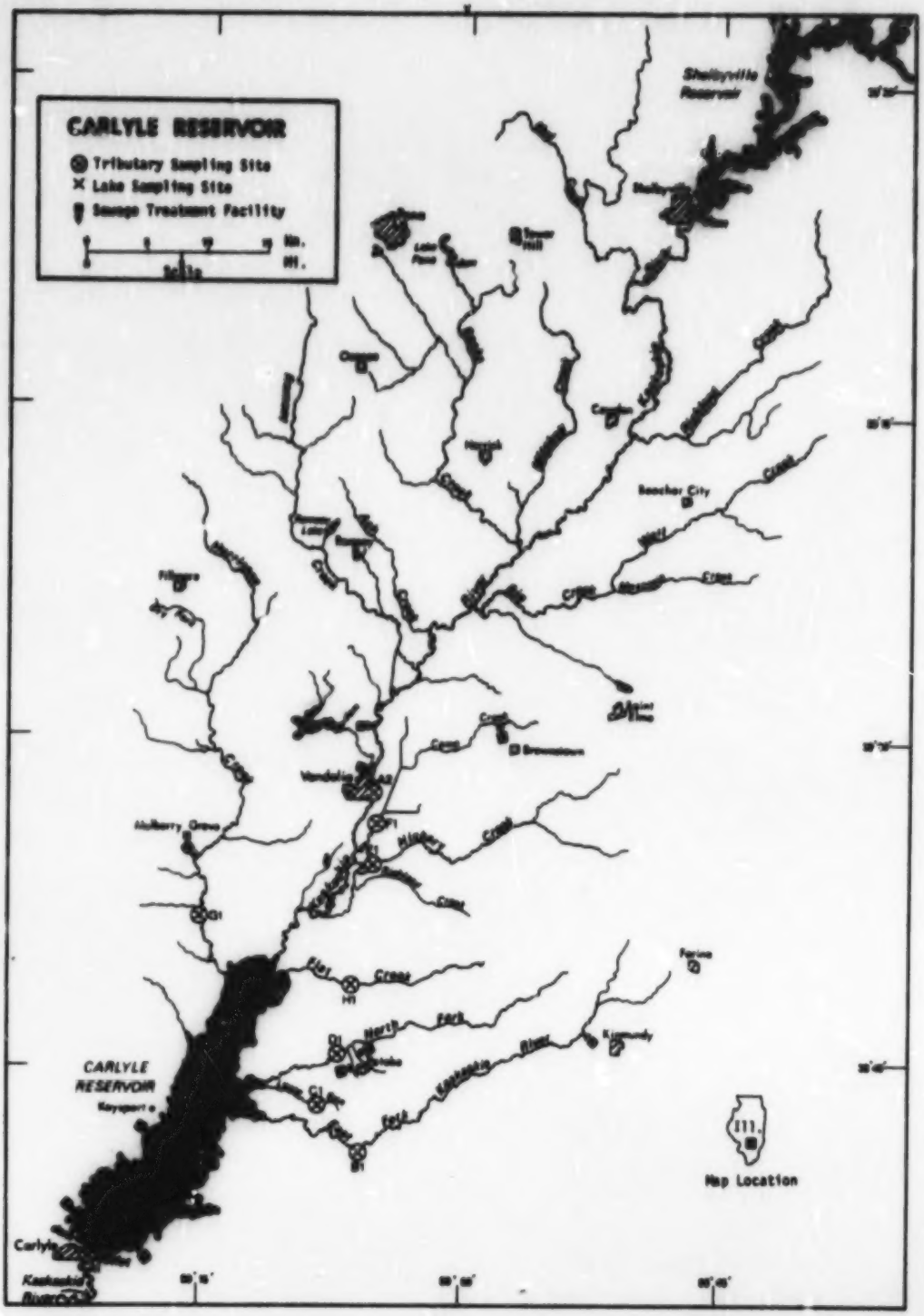
Major General Harold R. Patton, the Adjutant General of Illinois, and Project Officer Colonel Daniel L. Fane, who directed the volunteer efforts of the Illinois National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF ILLINOIS

| LAKE NAME | COUNTY |
|---|---|
| Baldwin | Randolph |
| Bloomington | McLean |
| Carlyle | Bond, Clinton, Fayette |
| Cedar | Lake |
| Charleston | Coles |
| Coffeen | Montgomery |
| Crab Orchard | Jackson, Williamson |
| Decatur | Macon |
| DePue | Bureau |
| East Loon | Lake |
| Fox | Lake |
| Grass | Lake |
| Highland Silver | Madison |
| Holiday | LaSalle |
| Horseshoe | Madison |
| Long | Lake |
| Lou Yaeger | Montgomery |
| Marie | Lake |
| Old Ben Mine | Franklin |
| Pistakee | Lake, McHenry |
| Raccoon | Marion |
| Rend | Franklin, Jefferson |
| Sangchris | Christian |
| Shelbyville | Moultrie, Shelby |
| Slocum | Lake |
| Springfield | Sangamon |
| Storey | Knox |
| Vandalia | Fayette |
| Vermilion | Vermilion |
| Wee Ma Tuk | Fulton |
| Wonder | McHenry |


CARLYLE RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Miles
Shelbyville Reservoir
Beecher City
Mulberry Grove
CARLYLE RESERVOIR
Carlyle
Kaskaskia River
Map Location

CARLYLE RESERVOIR

STORET NO. 1706

## I. CONCLUSIONS

### A. Trophic Condition:

Survey data indicate that Carlyle Reservoir is eutrophic. It ranked nineth in overall trophic quality when the 31 Illinois lakes sampled in 1973 were compared using a combination of six lake parameters*. Eleven of the lakes had less median total phosphorus, 14 had less median dissolved phosphorus, 18 had less median inorganic nitrogen, 11 had less mean chlorophyll a, and 11 had greater mean Secchi disc transparency. Some depression of dissolved oxygen with depth occurred at sampling stations 2 and 3 in August, 1973.

### B. Rate-Limiting Nutrient:

The algal assay results indicate phosphorus limitation at the time the sample was collected (05/08/73). The reservoir data also indicate phosphorus limitation; i.e., the mean N/P ratios were 27/1 or greater at all sampling stations and times.

### C. Nutrient Controllability:

1. Point sources--The phosphorus contribution of listed point sources amounted to 3.0% of the total reaching Carlyle Reservoir during the sampling year. The wastewater treatment

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* See Appendix A.

plants at Coles Creek, Illinois State Farm, and Kinmundy contributed 0.3% of this total. The remaining seven wastewater treatment plants were estimated to have contributed 2.7%, and shoreline septic tanks were estimated to have contributed less than 0.1% of the total load.

The above point sources contributed a relatively insignificant phosphorus load to the reservoir during the sampling year. However, at least seven additional municipal waste treatment facilities serving a combined population of 16,220 impact the reservoir†. The nutrient contributions of these sources are not included in the calculated loadings because the plants are located beyond the 40-kilometer limit of the Survey*, although it is likely that these nutrients eventually reach Carlyle Reservoir.

The present phosphorus loading rate of 3.00 $g/m^2/yr$ is about four times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate (see page 15). Even complete removal of phosphorus at the point sources, including the seven distant plants noted above (estimated at 1.134 g P/capita/yr), would only reduce the loading rate to 2.74 $g/m^2/yr$. However, Carlyle Reservoir is phosphorus limited, and any reduction in phosphorus input should result in at least some improvement in the trophic

† Anonymous, 1972.
* See Working Paper No. 175, "...Survey Methods, 1973-1976".

condition of this water body, particularly if phosphorus controls also are instituted at point sources impacting upstream Shelbyville Reservoir*.

2. Non-point sources--The phosphorus contributed by non-point sources accounted for 97.0% of the load reaching the reservoir during the sampling year. Of the measured tributaries, the Kaskaskia River contributed 71.4%, and the other seven tributaries collectively contributed a total of 17.1%. The ungaged drainage area was estimated to have contributed 7.9% of the total phosphorus load.

The phosphorus export rates of the Carlyle Reservoir tributaries ranged from 25 to 56 kg/km$^2$/yr (see page 14). These rates are comparable to those of the tributaries of upstream Shelbyville Reservoir. Excluding three of the latter streams that appear to have been impacted by unmeasured point sources (87, 95, and 145 kg/km$^2$/yr), the Shelbyville tributaries ranged from 20 to 44 kg/km$^2$/yr.

* Working Paper No. 315.

## II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

### A. Lake Morphometry††:

1. Surface area: 105.22 kilometers$^2$.
2. Mean depth: 2.7 meters.
3. Maximum depth: >11.0 meters.
4. Volume: 284.094 x $10^6$ $m^3$.
5. Mean hydraulic retention time: 64 days.

### B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

| Name | Drainage area ($km^2$)* | Mean flow ($m^3$/sec)* |
|---|---|---|
| Kaskaskia River | 5,024.6 | 36.3 |
| East Fk., Kaskaskia River | 292.7 | 1.9 |
| Louse Run | 35.5 | 0.2 |
| North Fork | 133.1 | 0.8 |
| Hickory Creek | 220.9 | 1.4 |
| Camp Creek | 137.5 | 0.9 |
| Hurricane Creek | 461.0 | 3.0 |
| Flat Creek | 55.7 | 0.4 |
| Minor tributaries & immediate drainage - | 576.0 | 6.2 |
| Totals | 6,937.0 | 51.1 |

2. Outlet -

| | | |
|---|---|---|
| Kaskaskia River | 7,042.2** | 51.1 |

### C. Precipitation***:

1. Year of sampling: 124.2 centimeters.
2. Mean annual: 102.0 centimeters.

† Table of metric conversions--Appendix B.
†† Forneris, 1973.
* For limits of accuracy, see Working Paper No. 175.
** Includes area of lake.
*** See Working Paper No. 175.

## III. LAKE WATER QUALITY SUMMARY

Carlyle Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the reservoir and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 8.5 meters at station 1, 10.7 meters at station 2, and 11.0 meters at station 3.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE CARLYLE
STORET CODE 1706

| PARAMETER | 1ST SAMPLING ( 5/ 8/73) 3 SITES RANGE | MEAN | MEDIAN | 2ND SAMPLING ( 8/10/73) 3 SITES RANGE | MEAN | MEDIAN | 3RD SAMPLING (10/10/73) 3 SITES RANGE | MEAN | MEDIAN |
|---|---|---|---|---|---|---|---|---|---|
| TEMP (C) | 15.7 - 16.7 | 16.2 | 16.3 | 26.5 - 29.3 | 27.1 | 26.9 | 17.1 - 18.8 | 17.9 | 18.0 |
| DISS OXY (MG/L) | 8.2 - 9.4 | 8.9 | 9.0 | 4.8 - 7.6 | 5.4 | 5.0 | 7.6 - 8.6 | 8.3 | 8.2 |
| CNDCTVY (MCROMO) | 338. - 400. | 378. | 393. | 385. - 406. | 392. | 389. | 353. - 364. | 359. | 359. |
| PH (STAND UNITS) | 7.8 - 8.2 | 8.1 | 8.1 | 7.1 - 8.4 | 7.7 | 7.8 | 8.0 - 8.3 | 8.1 | 8.1 |
| TOT ALK (MG/L) | 108. - 118. | 112. | 115. | 123. - 137. | 127. | 124. | 152. - 171. | 159. | 157. |
| TOT P (MG/L) | 0.067 - 0.126 | 0.090 | 0.082 | 0.059 - 0.116 | 0.084 | 0.084 | 0.076 - 0.119 | 0.091 | 0.086 |
| ORTHO P (MG/L) | 0.017 - 0.039 | 0.026 | 0.022 | 0.019 - 0.033 | 0.027 | 0.029 | 0.032 - 0.050 | 0.042 | 0.044 |
| NO2+NO3 (MG/L) | 1.110 - 1.720 | 1.483 | 1.570 | 0.860 - 1.340 | 1.074 | 1.070 | 1.190 - 1.280 | 1.241 | 1.248 |
| AMMONIA (MG/L) | 0.060 - 0.090 | 0.076 | 0.075 | 0.060 - 0.150 | 0.093 | 0.080 | 0.020 - 0.060 | 0.036 | 0.030 |
| KJEL N (MG/L) | 0.400 - 0.980 | 0.579 | 0.550 | 0.700 - 1.080 | 0.980 | 0.980 | 0.680 - 1.380 | 0.778 | 0.700 |
| INORG N (MG/L) | 1.260 - 1.790 | 1.559 | 1.645 | 0.920 - 1.490 | 1.167 | 1.165 | 1.240 - 1.330 | 1.277 | 1.270 |
| TOTAL N (MG/L) | 1.810 - 2.460 | 2.061 | 2.070 | 1.580 - 2.860 | 2.054 | 1.910 | 1.820 - 2.580 | 2.019 | 1.990 |
| CHLRPYL A (UG/L) | 13.8 - 17.8 | 15.5 | 15.0 | 8.7 - 31.3 | 16.7 | 10.1 | 9.8 - 38.8 | 19.9 | 11.0 |
| SECCHI (METERS) | 0.4 - 0.8 | 0.5 | 0.5 | 0.5 - 0.9 | 0.7 | 0.6 | 0.4 - 0.6 | 0.5 | 0.5 |

B. Biological characteristics:

1. Phytoplankton -

| Sampling Date | Dominant Genera | Algal units per ml |
|---|---|---|
| 05/08/73 | 1. Melosira sp. | 1,934 |
| | 2. Flagellates | 1,892 |
| | 3. Stephanodiscus sp. | 1,573 |
| | 4. Cryptomonas sp. | 616 |
| | 5. Synedra sp. | 255 |
| | Other genera | 533 |
| | Total | 6,803 |
| 08/10/73 | 1. Melosira sp. | 1,023 |
| | 2. Coccoid cells | 833 |
| | 3. Cyclotella sp. | 530 |
| | 4. Crucigenia sp. | 152 |
| | 5. Pennate diatoms | 152 |
| | Other genera | 456 |
| | Total | 3,146 |
| 10/18/73 | 1. Navicula sp. | 707 |
| | 2. Melosira sp. | 502 |
| | 3. Merismopedia sp. | 447 |
| | 4. Scenedesmus sp. | 187 |
| | 5. Flagellates | 130 |
| | Other genera | 372 |
| | Total | 2,345 |

2. Chlorophyll a -

| Sampling Date | Station Number | Chlorophyll a (µg/l) |
|---|---|---|
| 05/08/73 | 01 | 13.8 |
| | 02 | 17.8 |
| | 03 | 15.0 |
| 08/10/73 | 01 | 31.3 |
| | 02 | 10.1 |
| | 03 | 8.7 |
| 10/18/73 | 01 | 38.8 |
| | 02 | 9.8 |
| | 03 | 11.0 |

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

| Spike (mg/l) | Ortho P Conc. (mg/l) | Inorganic N Conc. (mg/l) | Maximum yield (mg/l-dry wt.) |
|---|---|---|---|
| Control | 0.025 | 1.820 | 8.7 |
| 0.050 P | 0.075 | 1.820 | 38.4 |
| 0.050 P + 1.0 N | 0.075 | 2.820 | 35.2 |
| 1.0 N | 0.025 | 2.820 | 8.4 |

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Carlyle Reservoir was high at the time the sample was collected. There was a significant increase in yield compared to the control when the level of orthophosphorus was increased. Note that there was no change in yield when nitrogen alone was added. These results indicate phosphorus limitation.

The reservoir data also indicate phosphorus limitation; i.e., the mean inorganic nitrogen/orthophosphorus ratios were 27/1 or greater at all sampling stations and times, and phosphorus limitation would be expected.

## IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Illinois National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of March when two samples were collected. Sampling was begun in June, 1973, and was completed in May, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Illinois District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km$^2$/year, at stations E-1 and H-1 and multiplying the means by the ZZ area in km$^2$.

The operators of the Coles Creek, Illinois State Farm, and Kinmundy wastewater treatment plants provided monthly effluent samples and corresponding flow data. Eldon Hazlet State Park, Vandalia, Brownstown,

* See Working Paper No. 175.

Mulberry Grove, Keysport, Patoka, and Patoka High School did not participate, and nutrient loads from these sources were estimated at 1.134 kg P and 3.401 kg N/capita/year.

A. Waste Sources:

1. Known municipal† -

| Name | Pop. Served | Treatment | Mean Flow ($m^3/d$) | Receiving Water |
|---|---|---|---|---|
| Coles Creek* | 600 | sand filter | 12.3 | Carlyle Reservoir |
| IL State Farm* | 1,000 | trickling filter | 455.4 | Kaskaskia River |
| Vandalia* | 5,500 | trickling filter | 2,081.8 | Kaskaskia River |
| Eldon Hazlet* State Park (2 plants) | 10 | ext. aer. + ponds | 3.8** | Carlyle Reservoir |
| Kinmundy | 60 | pond | 90.8 | East Fk., Kaskaskia River |
| Brownstown | 600 | trickling filter | 227.1** | Camp Creek |
| Mulberry Grove | 740 | pond | 280.1** | Hurricane Creek |
| Keysport | 300 | pond | 113.6** | Ditch/North Fork |
| Patoka | 200 | pond | 75.7** | Ditch/North Fork |
| Patoka High School | 130 | Imhoff tank | 49.2** | Unnamed Creek/ North Fork |

2. Known industrial - None

† Anonymous, 1972.
* Treatment plant questionnaires.
** Estimated at 0.3785 $m^3$/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

| Source | kg P/ yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| Kaskaskia River | 225,970 | 71.4 |
| East Fk., Kaskaskia River | 12,955 | 4.1 |
| Louse Run | 1,975 | 0.6 |
| North Fork | 6,046 | 1.9 |
| Hickory Creek | 5,515 | 1.7 |
| Camp Creek | 4,850 | 1.5 |
| Hurricane Creek | 20,290 | 6.4 |
| Flat Creek | 2,750 | 0.9 |
| b. Minor tributaries & immediate drainage (non-point load) - | 24,940 | 7.9 |
| c. Known municipal STP's - | | |
| Coles Creek | 10 | <0.1 |
| Illinois State Farm | 960 | 0.3 |
| Vandalia | 6,235 | 2.0 |
| Eldon Hazlet State Park | 10 | <0.1 |
| Kinmundy | 35 | <0.1 |
| Brownstown | 680 | 0.2 |
| Mulberry Grove | 840 | 0.3 |
| Keysport | 340 | 0.1 |
| Patoka | 225 | 0.1 |
| Patoka High School | 145 | <0.1 |
| d. Septic tanks* - | 20 | <0.1 |
| e. Known industrial - None | - | - |
| f. Direct precipitation** - | 1,840 | 0.6 |
| Total | 316,630 | 100.0 |

2. Outputs -

| | |
|---|---|
| Lake outlet - Kaskaskia River | 193,595 |

3. Net annual P accumulation - 123,035 kg.

* Estimate based on 50 dwellings, one park, and two campgrounds; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

| Source | kg N/yr | % of total |
|---|---|---|
| a. Tributaries (non-point load) - | | |
| Kaskaskia River | 4,130,435 | 81.4 |
| East Fk., Kaskaskia River | 124,325 | 2.5 |
| Louse Run | 14,285 | 0.3 |
| North Fork | 48,335 | 1.0 |
| Hickory Creek | 83,950 | 1.7 |
| Camp Creek | 49,435 | 1.0 |
| Hurricane Creek | 212,700 | 4.2 |
| Flat Creek | 26,295 | 0.5 |
| b. Minor tributaries & immediate drainage (non-point load) - | 240,885 | 4.7 |
| c. Known municipal STP's - | | |
| Coles Creek | 95 | <0.1 |
| Illinois State Farm | 1,890 | <0.1 |
| Vandalia | 18,705 | 0.4 |
| Eldon Hazlet State Park | 35 | <0.1 |
| Kinmundy | 145 | <0.1 |
| Brownstown | 2,040 | <0.1 |
| Mulberry Grove | 2,515 | 0.1 |
| Keysport | 1,020 | <0.1 |
| Patoka | 680 | <0.1 |
| Patoka High School | 440 | <0.1 |
| d. Septic tanks* - | 710 | <0.1 |
| e. Known industrial - None | - | - |
| f. Direct precipitation** - | 113,595 | 2.2 |
| Total | 5,072,515 | 100.0 |

2. Outputs -

Lake outlet - Kaskaskia River 4,578,925

3. Net annual N accumulation - 493,590 kg.

* Estimate based on 50 dwellings, one park, and two campgrounds; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

| Tributary | kg P/km²/yr | kg N/km²/yr |
|---|---|---|
| Kaskaskia River | 45 | 822 |
| East Fk., Kaskaskia River | 44 | 425 |
| Louse Run | 56 | 402 |
| North Fork | 45 | 363 |
| Hickory Creek | 25 | 380 |
| Camp Creek | 35 | 360 |
| Hurricane Creek | 44 | 461 |
| Flat Creek | 49 | 472 |

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

| | Total Phosphorus | | Total Nitrogen | |
|---|---|---|---|---|
| | Total | Accumulated | Total | Accumulated |
| grams/$m^2$/yr | 3.00 | 1.17 | 48.2 | 4.7 |

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Carlyle Reservoir:

| | |
|---|---|
| "Dangerous" (eutrophic rate) | 0.74 |
| "Permissible" (oligotrophic rate) | 0.37 |

## V. LITERATURE REVIEWED

Anonymous, 1972. Wastewater treatment works data book. IL Env. Prot. Agency, Springfield.

Forneris, John J., 1973. Personal communication (lake morphometry). IL Env. Prot. Agency, Springfield.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

# VI. APPENDICES

## APPENDIX A

## LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P |
|---|---|---|---|---|---|---|---|
| 1703 | LAKE BLOOMINGTON | 0.050 | 5.730 | 484.667 | 26.200 | 14.000 | 0.020 |
| 1706 | LAKE CARLYLE | 0.084 | 1.270 | 477.889 | 17.367 | 11.000 | 0.032 |
| 1708 | LAKE CHARLESTON | 0.160 | 4.680 | 490.667 | 12.800 | 8.400 | 0.065 |
| 1711 | COFFEEN LAKE | 0.032 | 0.260 | 456.222 | 7.700 | 14.900 | 0.012 |
| 1712 | CRAB ORCHARD LAKE | 0.082 | 0.200 | 482.222 | 59.867 | 13.000 | 0.013 |
| 1714 | LAKE DECATUR | 0.129 | 3.750 | 479.571 | 43.000 | 14.500 | 0.062 |
| 1725 | LONG LAKE | 0.704 | 1.190 | 482.667 | 49.333 | 8.000 | 0.398 |
| 1726 | LAKE LOU YAEGER | 0.106 | 1.680 | 489.583 | 10.662 | 11.400 | 0.076 |
| 1727 | LAKE MARIE | 0.098 | 0.370 | 467.667 | 39.533 | 14.700 | 0.057 |
| 1733 | PISTAKEE LAKE | 0.283 | 0.370 | 485.667 | 75.867 | 7.800 | 0.062 |
| 1735 | RENO LAKE | 0.071 | 0.210 | 471.500 | 23.533 | 12.700 | 0.012 |
| 1739 | LAKE SHELBYVILLE | 0.062 | 3.290 | 461.333 | 17.161 | 14.000 | 0.019 |
| 1740 | SILVER LAKE (HIGHLAND) | 0.226 | 0.970 | 489.500 | 5.822 | 14.000 | 0.057 |
| 1742 | LAKE SPRINGFIELD | 0.108 | 3.265 | 483.305 | 13.013 | 10.000 | 0.050 |
| 1748 | VERMILION LAKE | 0.109 | 4.695 | 481.500 | 31.150 | 14.200 | 0.030 |
| 1750 | WONDER LAKE | 0.426 | 0.090 | 486.000 | 98.533 | 7.000 | 0.132 |
| 1751 | LAKE STORY | 0.072 | 2.510 | 459.333 | 17.250 | 14.000 | 0.021 |
| 1752 | DEPUE LAKE | 0.438 | 4.050 | 490.000 | 58.833 | 7.600 | 0.270 |
| 1753 | LAKE SANGCHRIS | 0.050 | 1.970 | 475.417 | 10.292 | 14.500 | 0.009 |
| 1754 | LAKE HOLIDAY | 0.167 | 3.135 | 485.167 | 51.217 | 7.200 | 0.046 |
| 1755 | FOX LAKE | 0.219 | 0.375 | 486.167 | 63.850 | 8.000 | 0.083 |
| 1756 | GRASS LAKE | 0.301 | 0.020 | 481.000 | 83.500 | 5.900 | 0.093 |
| 1757 | EAST LOON LAKE | 0.076 | 0.120 | 450.000 | 22.300 | 14.900 | 0.018 |
| 1758 | SLOCUM LAKE | 0.865 | 0.200 | 487.333 | 221.100 | 5.800 | 0.362 |
| 1759 | CEDAR LAKE | 0.029 | 0.170 | 480.333 | 5.767 | 12.800 | 0.013 |
| 1761 | LAKE WENATUK | 0.069 | 1.770 | 466.333 | 7.967 | 14.500 | 0.031 |
| 1762 | RACCOON LAKE | 0.106 | 0.310 | 484.333 | 19.217 | 13.800 | 0.020 |
| 1763 | BALDWIN LAKE | 0.044 | 0.140 | 461.167 | 11.333 | 13.200 | 0.007 |

LAKE DATA TO BE USED IN RANKINGS

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P |
|---|---|---|---|---|---|---|---|
| 1764 | LAKE VANDALIA | 0.116 | 0.480 | 478.111 | 11.278 | 14.800 | 0.023 |
| 1765 | OLD BEN MINE RESERVOIR | 0.930 | 0.205 | 478.333 | 31.433 | 11.200 | 0.575 |
| 1766 | HORSESHOE LAKE | 0.127 | 0.705 | 482.833 | 182.250 | 6.800 | 0.018 |

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | SUM-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 1703 | LAKE BLOOMINGTON | 88 ( 26) | 0 ( 0) | 80 ( 24) | 47 ( 14) | 13 ( 2) | 68 ( 20) | 296 |
| 1706 | LAKE CARLYLE | 63 ( 19) | 40 ( 12) | 63 ( 19) | 63 ( 19) | 63 ( 19) | 53 ( 16) | 345 |
| 1708 | LAKE CHARLESTON | 37 ( 11) | 7 ( 2) | 0 ( 0) | 77 ( 23) | 77 ( 23) | 27 ( 8) | 225 |
| 1711 | COFFEEN LAKE | 97 ( 29) | 77 ( 23) | 93 ( 28) | 93 ( 28) | 2 ( 0) | 92 ( 27) | 454 |
| 1712 | CRAB ORCHARD LAKE | 67 ( 20) | 90 ( 27) | 43 ( 13) | 20 ( 6) | 42 ( 12) | 85 ( 25) | 347 |
| 1714 | LAKE DECATUR | 40 ( 12) | 13 ( 4) | 53 ( 16) | 33 ( 10) | 30 ( 8) | 32 ( 9) | 201 |
| 1725 | LONG LAKE | 7 ( 2) | 43 ( 13) | 40 ( 12) | 30 ( 9) | 72 ( 21) | 3 ( 1) | 195 |
| 1726 | LAKE LOU YAEGER | 30 ( 9) | 37 ( 11) | 7 ( 2) | 87 ( 26) | 57 ( 17) | 23 ( 7) | 261 |
| 1727 | LAKE MARIE | 60 ( 18) | 68 ( 20) | 73 ( 22) | 37 ( 11) | 23 ( 7) | 42 ( 12) | 383 |
| 1733 | PISTAKEE LAKE | 27 ( 8) | 68 ( 20) | 23 ( 7) | 13 ( 4) | 90 ( 27) | 32 ( 9) | 253 |
| 1735 | REND LAKE | 77 ( 23) | 80 ( 24) | 70 ( 21) | 50 ( 15) | 53 ( 16) | 92 ( 27) | 422 |
| 1739 | LAKE SHELBYVILLE | 83 ( 25) | 17 ( 5) | 83 ( 25) | 70 ( 21) | 13 ( 2) | 73 ( 22) | 399 |
| 1740 | SILVER LAKE (HIGHLAND) | 20 ( 6) | 47 ( 14) | 10 ( 3) | 97 ( 29) | 13 ( 2) | 42 ( 12) | 229 |
| 1742 | LAKE SPRINGFIELD | 53 ( 16) | 20 ( 6) | 33 ( 10) | 73 ( 22) | 67 ( 20) | 37 ( 11) | 283 |
| 1748 | VERMILION LAKE | 50 ( 15) | 3 ( 1) | 47 ( 14) | 43 ( 13) | 37 ( 11) | 47 ( 14) | 227 |
| 1750 | WONDER LAKE | 13 ( 4) | 50 ( 15) | 20 ( 6) | 7 ( 2) | 80 ( 24) | 13 ( 4) | 183 |
| 1751 | LAKE STORY | 73 ( 22) | 27 ( 8) | 90 ( 27) | 67 ( 20) | 13 ( 2) | 63 ( 19) | 333 |
| 1752 | DEPUE LAKE | 10 ( 3) | 10 ( 3) | 3 ( 1) | 23 ( 7) | 83 ( 25) | 10 ( 3) | 139 |
| 1753 | LAKE SANDCHRIS | 88 ( 26) | 30 ( 9) | 67 ( 20) | 57 ( 17) | 30 ( 8) | 97 ( 29) | 359 |
| 1754 | LAKE HOLIDAY | 33 ( 10) | 23 ( 7) | 27 ( 8) | 27 ( 8) | 87 ( 26) | 50 ( 15) | 247 |
| 1755 | FOX LAKE | 23 ( 7) | 63 ( 19) | 17 ( 5) | 17 ( 5) | 72 ( 21) | 20 ( 6) | 212 |
| 1756 | GRASS LAKE | 17 ( 5) | 53 ( 16) | 50 ( 15) | 10 ( 3) | 97 ( 29) | 17 ( 5) | 244 |
| 1757 | EAST LOON LAKE | 70 ( 21) | 100 ( 30) | 97 ( 29) | 53 ( 16) | 2 ( 0) | 77 ( 23) | 399 |
| 1758 | SLOCUM LAKE | 3 ( 1) | 87 ( 26) | 13 ( 4) | 0 ( 0) | 100 ( 30) | 7 ( 2) | 210 |
| 1759 | CEDAR LAKE | 100 ( 30) | 93 ( 28) | 100 ( 30) | 100 ( 30) | 50 ( 15) | 85 ( 25) | 526 |
| 1761 | LAKE WENATUK | 80 ( 24) | 33 ( 10) | 77 ( 23) | 90 ( 27) | 30 ( 8) | 57 ( 17) | 367 |
| 1762 | RACCOON LAKE | 57 ( 17) | 73 ( 22) | 30 ( 9) | 60 ( 18) | 42 ( 12) | 68 ( 20) | 330 |
| 1763 | BALDWIN LAKE | 93 ( 28) | 97 ( 29) | 87 ( 26) | 80 ( 24) | 47 ( 14) | 100 ( 30) | 504 |

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

| LAKE CODE | LAKE NAME | MEDIAN TOTAL P | MEDIAN INORG N | 500-MEAN SEC | MEAN CHLORA | 15-MIN DO | MEDIAN DISS ORTHO P | INDEX NO |
|---|---|---|---|---|---|---|---|---|
| 1764 | LAKE VANDALIA | 47 ( 14) | 60 ( 18) | 60 ( 18) | 83 ( 25) | 13 ( 2) | 60 ( 18) | 323 |
| 1765 | OLD BEN MINE RESERVOIR | 0 ( 0) | 83 ( 25) | 57 ( 17) | 40 ( 12) | 60 ( 18) | 0 ( 0) | 240 |
| 1766 | HORSESHOE LAKE | 43 ( 13) | 57 ( 17) | 37 ( 11) | 3 ( 1) | 93 ( 28) | 80 ( 24) | 313 |

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 1 | 1759 | CEDAR LAKE | 528 |
| 2 | 1763 | BALDWIN LAKE | 504 |
| 3 | 1711 | COFFEEN LAKE | 454 |
| 4 | 1735 | REND LAKE | 422 |
| 5 | 1757 | EAST LOON LAKE | 399 |
| 6 | 1753 | LAKE SANGCHRIS | 369 |
| 7 | 1761 | LAKE WEHATUK | 367 |
| 8 | 1712 | CRAB ORCHARD LAKE | 347 |
| 9 | 1706 | LAKE CARLYLE | 345 |
| 10 | 1739 | LAKE SHELBYVILLE | 339 |
| 11 | 1751 | LAKE STORY | 333 |
| 12 | 1762 | RACCOON LAKE | 330 |
| 13 | 1764 | LAKE VANDALIA | 323 |
| 14 | 1766 | HORSESHOE LAKE | 313 |
| 15 | 1727 | LAKE MARIE | 303 |
| 16 | 1703 | LAKE BLOOMINGTON | 296 |
| 17 | 1742 | LAKE SPRINGFIELD | 283 |
| 18 | 1733 | PISTAKEE LAKE | 253 |
| 19 | 1754 | LAKE HOLIDAY | 247 |
| 20 | 1756 | GRASS LAKE | 244 |
| 21 | 1726 | LAKE LOU YAEGER | 241 |
| 22 | 1765 | OLD BEN MINE RESERVOIR | 240 |
| 23 | 1740 | SILVER LAKE (HIGHLAND) | 229 |
| 24 | 1748 | VERMILION LAKE | 227 |
| 25 | 1708 | LAKE CHARLESTON | 225 |
| 26 | 1755 | FOX LAKE | 212 |
| 27 | 1758 | SLOCUM LAKE | 210 |
| 28 | 1714 | LAKE DECATUR | 201 |

LAKES RANKED BY INDEX NOS.

| RANK | LAKE CODE | LAKE NAME | INDEX NO |
|---|---|---|---|
| 29 | 1725 | LONG LAKE | 195 |
| 30 | 1750 | WONDER LAKE | 183 |
| 31 | 1752 | DEPUE LAKE | 139 |

# APPENDIX B

## CONVERSIONS FACTORS

## CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x $8.107 \times 10^{-4}$ = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

# APPENDIX C

## TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1706 LAKE CARLYLE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 7042.2

| TRIBUTARY | SUB-DRAINAGE AREA(SQ KM) | NORMALIZED FLOWS(CMS) JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1706A1 | 7042.2 | 51.82 | 64.85 | 90.90 | 93.16 | 99.39 | 54.65 | 37.10 | 22.86 | 17.98 | 21.24 | 28.60 | 32.80 | [illegible] |
| 1706A2 | 5824.6 | 37.10 | 46.72 | 64.56 | 66.83 | 71.36 | 38.79 | 26.11 | 15.23 | 12.18 | 14.64 | 19.85 | 22.57 | 36.26 |
| 1706B1 | 292.7 | 1.96 | 2.83 | 3.57 | 3.68 | 2.92 | 2.40 | 1.48 | 0.77 | 0.56 | 0.63 | 0.90 | 1.06 | 1.80 |
| 1706C1 | 35.5 | 0.22 | 0.35 | 0.42 | 0.43 | 0.34 | 0.29 | 0.17 | 0.09 | 0.06 | 0.06 | 0.10 | 0.11 | 0.22 |
| 1706D1 | 133.1 | 0.86 | 1.29 | 1.61 | 1.66 | 1.30 | 1.09 | 0.66 | 0.34 | 0.24 | 0.27 | 0.39 | 0.46 | 0.84 |
| 1706E1 | 220.9 | 1.46 | 2.15 | 2.68 | 2.77 | 2.18 | 1.81 | 1.11 | 0.58 | 0.41 | 0.45 | 0.67 | 0.79 | 1.42 |
| 1706F1 | 137.5 | 0.89 | 1.34 | 1.66 | 1.71 | 1.35 | 1.13 | 0.68 | 0.35 | 0.25 | 0.27 | 0.40 | 0.48 | 0.87 |
| 1706G1 | 461.8 | 3.14 | 4.47 | 5.66 | 5.86 | 4.62 | 3.79 | 2.35 | 1.24 | 0.91 | 1.04 | 1.46 | 1.71 | 3.01 |
| 1706H1 | 55.7 | 0.35 | 0.54 | 0.66 | 0.68 | 0.54 | 0.46 | 0.27 | 0.14 | 0.10 | 0.10 | 0.15 | 0.18 | 0.35 |
| 1706ZZ | 681.2 | 5.83 | 5.15 | 10.08 | 9.54 | 14.81 | 4.90 | 4.28 | 3.31 | 3.20 | 3.77 | 4.67 | 4.64 | 6.20 |

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 7042.2
SUM OF SUB-DRAINAGE AREAS = 7042.2

TOTAL FLOW IN = 613.67
TOTAL FLOW OUT = 613.65

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 1706A1 | 6 | 73 | 123.18 | 2 | 189.30 | | | | |
| | 7 | 73 | 137.62 | 8 | 146.11 | | | | |
| | 8 | 73 | 114.97 | 5 | 115.25 | | | | |
| | 9 | 73 | 52.67 | 9 | 45.31 | | | | |
| | 10 | 73 | 16.03 | 14 | 6.34 | | | | |
| | 11 | 73 | 22.31 | 3 | 6.29 | | | | |
| | 12 | 73 | 90.33 | 2 | 66.26 | | | | |
| | 1 | 74 | 131.67 | 6 | 52.95 | | | | |
| | 2 | 74 | 208.44 | 17 | 277.79 | | | | |
| | 3 | 74 | 281.75 | 3 | 282.60 | 16 | 279.28 | | |
| | 4 | 74 | 190.86 | 7 | 276.66 | | | | |
| | 5 | 74 | 71.64 | 4 | 82.48 | | | | |
| 1706A2 | 6 | 73 | 105.34 | 2 | 58.85 | | | | |
| | 7 | 73 | 64.88 | 8 | 58.85 | | | | |
| | 8 | 73 | 66.26 | 5 | 67.68 | | | | |
| | 9 | 73 | 54.93 | 9 | 69.94 | | | | |
| | 10 | 73 | 19.45 | 14 | 17.19 | | | | |
| | 11 | 73 | 28.88 | 3 | 8.24 | | | | |
| | 12 | 73 | 92.31 | 2 | 50.69 | | | | |
| | 1 | 74 | 140.73 | 6 | 68.24 | | | | |
| | 2 | 74 | 171.03 | 17 | 150.36 | | | | |
| | 3 | 74 | 169.90 | 3 | 280.20 | 16 | 176.41 | | |
| | 4 | 74 | 98.83 | 7 | 114.48 | | | | |
| | 5 | 74 | 62.86 | 4 | 37.10 | | | | |

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1706 LAKE CARLYLE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 1706B1 | 6 | 73 | 9.88 | 2 | 0.64 | | | | |
| | 7 | 73 | 2.24 | 8 | 0.54 | | | | |
| | 8 | 73 | 0.22 | 5 | 0.04 | | | | |
| | 9 | 73 | 0.00 | 9 | 0.03 | | | | |
| | 10 | 73 | 0.01 | 14 | 0.01 | | | | |
| | 11 | 73 | 10.36 | 3 | 0.24 | | | | |
| | 12 | 73 | 3.82 | 2 | 1.73 | | | | |
| | 1 | 74 | 6.63 | 6 | 2.63 | | | | |
| | 2 | 74 | 8.64 | 17 | 9.12 | | | | |
| | 3 | 74 | 7.82 | 3 | 11.10 | 16 | 9.74 | | |
| | 4 | 74 | 4.59 | 7 | 6.29 | | | | |
| | 5 | 74 | 2.38 | 4 | 1.53 | | | | |
| 1706C1 | 6 | 73 | 2.32 | 2 | 0.04 | | | | |
| | 7 | 73 | 0.26 | 8 | 0.05 | | | | |
| | 8 | 73 | 0.03 | 5 | 0.01 | | | | |
| | 9 | 73 | 0.0 | 9 | 0.00 | | | | |
| | 10 | 73 | 0.0 | 14 | 0.0 | | | | |
| | 11 | 73 | 0.07 | 3 | 0.0 | | | | |
| | 12 | 73 | 0.05 | 2 | 0.02 | | | | |
| | 1 | 74 | 1.13 | 6 | 0.15 | | | | |
| | 2 | 74 | 0.71 | 17 | 0.07 | | | | |
| | 3 | 74 | 0.79 | 3 | 0.48 | 16 | 0.26 | | |
| | 4 | 74 | 1.02 | 7 | 0.37 | | | | |
| | 5 | 74 | 1.42 | 4 | 0.20 | | | | |
| 1706D1 | 6 | 73 | 3.09 | 2 | 0.16 | | | | |
| | 7 | 73 | 0.99 | 8 | 0.20 | | | | |
| | 8 | 73 | 0.10 | 5 | 0.02 | | | | |
| | 9 | 73 | 0.0 | 9 | 0.01 | | | | |
| | 11 | 73 | 0.45 | 3 | 0.10 | | | | |
| | 12 | 73 | 1.67 | 2 | 0.76 | | | | |
| | 1 | 74 | 2.92 | 6 | 1.16 | | | | |
| | 2 | 74 | 3.94 | 17 | 4.16 | | | | |
| | 3 | 74 | 3.51 | 3 | 4.98 | 16 | 4.39 | | |
| | 4 | 74 | 2.87 | 7 | 2.83 | | | | |
| | 5 | 74 | 1.88 | 4 | 0.68 | | | | |
| 1706E1 | 6 | 73 | 5.13 | 2 | 0.27 | | | | |
| | 7 | 73 | 1.67 | 8 | 0.34 | | | | |
| | 8 | 73 | 0.17 | 5 | 0.03 | | | | |
| | 9 | 73 | 0.00 | 9 | 0.03 | | | | |
| | 10 | 73 | 0.01 | 14 | 0.01 | | | | |
| | 11 | 73 | 0.76 | 3 | 0.17 | | | | |
| | 12 | 73 | 2.84 | 2 | 1.30 | | | | |
| | 1 | 74 | 4.96 | 6 | 1.98 | | | | |
| | 2 | 74 | 6.54 | 17 | 6.91 | | | | |
| | 3 | 74 | 5.89 | 3 | 8.35 | 16 | 7.33 | | |
| | 4 | 74 | 3.45 | 7 | 4.73 | | | | |
| | 5 | 74 | 1.78 | 4 | 1.13 | | | | |

28
A3

TRIBUTARY FLOW INFORMATION FOR ILLINOIS 10/23/75

LAKE CODE 1706 LAKE CARLYLE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

| TRIBUTARY | MONTH | YEAR | MEAN FLOW | DAY | FLOW | DAY | FLOW | DAY | FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 1706F1 | 6 | 73 | 3.20 | 2 | 0.17 | | | | |
| | 7 | 73 | 1.02 | 8 | 0.20 | | | | |
| | 8 | 73 | 0.10 | 5 | 0.02 | | | | |
| | 9 | 73 | 0.0 | 9 | 0.01 | | | | |
| | 10 | 73 | 0.01 | 14 | 0.01 | | | | |
| | 11 | 73 | 0.45 | 3 | 0.10 | | | | |
| | 12 | 73 | 1.73 | 2 | 0.79 | | | | |
| | 1 | 74 | 3.03 | 6 | 1.22 | | | | |
| | 2 | 74 | 4.08 | 17 | 4.30 | | | | |
| | 3 | 74 | 3.62 | 3 | 5.15 | 16 | 4.53 | | |
| | 4 | 74 | 2.15 | 7 | 2.92 | | | | |
| | 5 | 74 | 1.10 | 4 | 0.71 | | | | |
| 1706G1 | 6 | 73 | 14.22 | 2 | 1.08 | | | | |
| | 7 | 73 | 3.57 | 8 | 0.71 | | | | |
| | 8 | 73 | 0.37 | 5 | 0.06 | | | | |
| | 9 | 73 | 0.01 | 9 | 0.05 | | | | |
| | 10 | 73 | 0.02 | 14 | 0.02 | | | | |
| | 11 | 73 | 1.67 | 3 | 0.37 | | | | |
| | 12 | 73 | 6.20 | 2 | 2.80 | | | | |
| | 1 | 74 | 10.65 | 6 | 4.25 | | | | |
| | 2 | 74 | 13.65 | 17 | 14.41 | | | | |
| | 3 | 74 | 12.40 | 3 | 17.61 | 16 | 15.46 | | |
| | 4 | 74 | 7.33 | 7 | 10.00 | | | | |
| | 5 | 74 | 3.79 | 4 | 2.41 | | | | |
| 1706H1 | 6 | 73 | 1.30 | 2 | 0.07 | | | | |
| | 7 | 73 | 0.40 | 8 | 0.08 | | | | |
| | 8 | 73 | 0.04 | 5 | 0.01 | | | | |
| | 9 | 73 | 0.0 | 9 | 0.01 | | | | |
| | 10 | 73 | 0.00 | 14 | 0.00 | | | | |
| | 11 | 73 | 0.11 | 3 | 0.0 | | | | |
| | 12 | 73 | 0.00 | 2 | 0.04 | | | | |
| | 1 | 74 | 1.01 | 6 | 0.23 | | | | |
| | 2 | 74 | 1.00 | 17 | 0.11 | | | | |
| | 3 | 74 | 1.27 | 3 | 0.62 | 16 | 0.42 | | |
| | 4 | 74 | 1.59 | 7 | 0.59 | | | | |
| | 5 | 74 | 2.24 | 4 | 0.31 | | | | |
| 1706ZZ | 6 | 73 | 15.91 | 2 | 0.85 | | | | |
| | 7 | 73 | 5.30 | 8 | 1.05 | | | | |
| | 8 | 73 | 0.54 | 5 | 0.09 | | | | |
| | 9 | 73 | 0.01 | 9 | 0.12 | | | | |
| | 10 | 73 | 0.01 | 14 | 0.12 | | | | |
| | 11 | 73 | 2.55 | 3 | 0.57 | | | | |
| | 12 | 73 | 9.32 | 2 | 4.22 | | | | |
| | 1 | 74 | 15.94 | 6 | 6.34 | | | | |
| | 2 | 74 | 19.68 | 17 | 19.88 | | | | |
| | 3 | 74 | 17.95 | 3 | 24.52 | 16 | 20.02 | | |
| | 4 | 74 | 11.30 | 7 | 14.10 | | | | |
| | 5 | 74 | 6.99 | 4 | 3.54 | | | | |

# APPENDIX D

## PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/10/23

170601
38 43 43.0 089 16 14.0
LAKE CARLYLE
17027 ILLINOIS

11EPALES
3

2111202
0032 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00010 WATER TEMP CENT | 00300 DO MG/L | 00077 TRANSP SECCHI INCHES | 00094 CNDUCTVY FIELD MICROMHO | 00400 PH SU | 00410 T ALK CACO3 MG/L | 00610 NH3-N TOTAL MG/L | 00625 TOT KJEL N MG/L | 00630 NO2&NO3 N-TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73/05/08 | 14 | 20 0000 | 16.7 | | 15 | 350 | 7.80 | 101 | 0.090 | 0.800 | 1.150 | 0.039 |
| | 14 | 20 0006 | 16.6 | 8.8 | | 335 | 7.90 | 101 | 0.080 | 0.700 | 1.120 | 0.039 |
| | 14 | 20 0015 | 16.6 | 8.2 | | 330 | 7.90 | 101 | 0.090 | 0.700 | 1.110 | 0.039 |
| | 14 | 20 0028 | 16.6 | 8.3 | | 330 | 7.90 | 100 | 0.080 | 0.600 | 1.260 | 0.037 |
| 73/08/10 | 09 | 45 0000 | 27.2 | 5.4 | 24 | 403 | 7.90 | 135 | 0.150 | 1.600 | 1.260 | 0.022 |
| | 09 | 45 0004 | 27.1 | | | 405 | | | | | | |
| | 09 | 45 0008 | 27.1 | 5.0 | | 406 | 7.80 | 137 | 0.150 | 1.300 | 1.340 | 0.023 |
| 73/10/18 | 12 | 23 0000 | 17.2 | | 16 | 364 | 8.20 | 171 | 0.030 | 1.300 | 1.280 | 0.033 |
| | 12 | 23 0005 | 17.1 | 8.8 | | 364 | 8.20 | 169 | 0.020 | 0.900 | 1.250 | 0.032 |
| | 12 | 23 0019 | 17.1 | 8.8 | | 364 | 8.10 | 167 | 0.030 | 0.900 | 1.240 | 0.033 |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L |
|---|---|---|---|---|
| 73/05/08 | 14 | 20 0000 | 0.126 | 13.8 |
| | 14 | 20 0006 | 0.110 | |
| | 14 | 20 0015 | 0.112 | |
| | 14 | 20 0028 | 0.111 | |
| 73/08/10 | 09 | 45 0000 | 0.096 | 31.3 |
| | 09 | 45 0008 | 0.090 | |
| 73/10/18 | 12 | 23 0000 | 0.090 | 38.8 |
| | 12 | 23 0005 | 0.100 | |
| | 12 | 23 0019 | 0.119 | |

STORET RETRIEVAL DATE 75/10/.)

170602
38 40 03.0 089 18 24.0
LAKE CARLYLE
17027 ILLINOIS

11EPALES
3

2111202
0039 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00010 WATER TEMP CENT | 00300 DO MG/L | 00077 TRANSP SECCHI INCHES | 00094 CNDUCTVY FIELD MICROMHO | 00400 PH SU | 00410 T ALK CACO3 MG/L | 00610 NH3-N TOTAL MG/L | 00625 TOT KJEL N MG/L | 00630 NO2&NO3 N-TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73/05/08 | 14 | 50 0000 | 16.4 | | 18 | 385 | 8.10 | 115 | 0.080 | 0.600 | 1.500 | 0.019 |
| | 14 | 50 0006 | 16.4 | 9.4 | | 395 | 8.20 | 116 | 0.070 | 0.500 | 1.540 | 0.021 |
| | 14 | 50 0015 | 16.3 | 9.0 | | 400 | 8.20 | 116 | 0.070 | 0.600 | 1.560 | 0.020 |
| | 14 | 50 0025 | 16.3 | 8.8 | | 400 | 8.20 | 118 | 0.080 | 0.500 | 1.600 | 0.021 |
| | 14 | 50 0035 | 16.3 | 9.0 | | 400 | 8.20 | 117 | 0.090 | 0.400 | 1.640 | 0.024 |
| 73/08/10 | 13 | 15 0000 | 27.3 | | 20 | 389 | 7.80 | 125 | 0.100 | 1.100 | 1.080 | 0.032 |
| | 13 | 15 0005 | 27.0 | 5.6 | | 391 | 7.70 | 124 | 0.080 | 0.900 | 1.160 | 0.030 |
| | 13 | 15 0010 | 26.9 | | | 388 | | | | | | |
| | 13 | 15 0015 | 26.8 | 5.0 | | 389 | 7.10 | 124 | 0.080 | 0.700 | 1.130 | 0.033 |
| | 13 | 15 0020 | 26.8 | | | 389 | | | | | | |
| | 13 | 15 0025 | 26.7 | 4.6 | | 389 | 7.50 | 124 | 0.080 | 0.800 | 1.050 | 0.033 |
| | 13 | 15 0030 | 26.7 | 4.0 | | 386 | 7.50 | 123 | 0.090 | 0.900 | 1.060 | 0.032 |
| 73/10/18 | 12 | 50 0000 | 18.1 | | 18 | 359 | 8.10 | 157 | 0.050 | 0.700 | 1.190 | 0.047 |
| | 12 | 50 0015 | 18.0 | 8.0 | | 357 | 8.00 | 157 | 0.040 | 0.600 | 1.280 | 0.050 |
| | 12 | 50 0026 | 18.0 | 7.6 | | 359 | 8.00 | 156 | 0.060 | 0.600 | 1.270 | 0.049 |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L |
|---|---|---|---|---|
| 73/05/08 | 14 | 50 0000 | 0.083 | 17.8 |
| | 14 | 50 0006 | 0.081 | |
| | 14 | 50 0015 | 0.067 | |
| | 14 | 50 0025 | 0.080 | |
| | 14 | 50 0035 | 0.091 | |
| 73/08/10 | 13 | 15 0000 | 0.078 | 10.1 |
| | 13 | 15 0005 | 0.071 | |
| | 13 | 15 0015 | 0.087 | |
| | 13 | 15 0025 | 0.096 | |
| | 13 | 15 0030 | 0.116 | |
| 73/10/18 | 12 | 50 0000 | 0.086 | 9.8 |
| | 12 | 50 0015 | 0.076 | |
| | 12 | 50 0026 | 0.110 | |

STORET RETRIEVAL DATE 75/10/23

170603
38 37 15.0 089 20 44.0
LAKE CARLYLE
17027 ILLINOIS

11EPALES
3

2111202
0040 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00010 WATER TEMP CENT | 00300 DO MG/L | 00077 TRANSP SECCHI INCHES | 00094 CNDUCTVY FIELD MICROMHO | 00400 PH SU | 00410 T ALK CACO3 MG/L | 00610 NH3-N TOTAL MG/L | 00625 TOT KJEL N MG/L | 00630 NO2&NO3 N-TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73/05/08 | 16 45 | 0000 | 16.0 | | 30 | 390 | 8.20 | 116 | 0.070 | 0.900 | 1.560 | 0.024 |
| | 16 45 | 0006 | 16.0 | 9.4 | | 395 | 8.20 | 116 | 0.060 | 0.480 | 1.600 | 0.019 |
| | 16 45 | 0015 | 15.9 | 8.9 | | 400 | 8.10 | 115 | 0.060 | 0.500 | 1.610 | 0.020 |
| | 16 45 | 0025 | 15.7 | 9.0 | | 390 | 8.10 | 115 | 0.070 | 0.500 | 1.710 | 0.025 |
| | 16 45 | 0036 | 15.7 | 9.2 | | 395 | 8.10 | 114 | 0.070 | 0.480 | 1.720 | 0.017 |
| 73/08/10 | 13 55 | 0000 | 29.3 | 7.6 | 34 | 398 | 8.40 | 124 | 0.060 | 1.000 | 0.860 | 0.019 |
| | 13 55 | 0005 | 27.3 | 6.0 | | 388 | 8.00 | 124 | 0.060 | 0.700 | 0.880 | 0.022 |
| | 13 55 | 0010 | 26.8 | | | 387 | | | | | | |
| | 13 55 | 0015 | 26.6 | | | 385 | | | | | | |
| | 13 55 | 0019 | 26.5 | 5.0 | | 385 | 7.80 | 126 | 0.080 | 0.800 | 0.920 | 0.028 |
| 73/10/18 | 13 14 | 0000 | 18.8 | | 24 | 357 | 8.30 | 153 | 0.030 | 0.800 | 1.220 | 0.044 |
| | 13 14 | 0015 | 18.4 | 8.2 | | 354 | 8.20 | 152 | 0.030 | 0.600 | 1.220 | 0.045 |
| | 13 14 | 0024 | 18.2 | 8.2 | | 353 | 8.10 | 152 | 0.030 | 0.600 | 1.220 | 0.044 |

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00665 PHOS-TOT MG/L P | 32217 CHLRPHYL A UG/L |
|---|---|---|---|---|
| 73/05/08 | 16 45 | 0000 | 0.092 | 15.0 |
| | 16 45 | 0006 | 0.075 | |
| | 16 45 | 0015 | 0.072 | |
| | 16 45 | 0025 | 0.077 | |
| | 16 45 | 0036 | 0.078 | |
| 73/08/10 | 13 55 | 0000 | 0.063 | 8.7 |
| | 13 55 | 0005 | 0.059 | |
| | 13 55 | 0019 | 0.082 | |
| 73/10/18 | 13 14 | 0000 | 0.080 | 11.0 |
| | 13 14 | 0015 | 0.078 | |
| | 13 14 | 0024 | 0.084 | |

# APPENDIX E

## TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STONET RETRIEVAL DATE 75/10/23

1706A1
38 37 10.0 089 21 13.0
KASKASKIA
17113 7.5 CARLYLE
O/LAKE CARLYLE
CARLYLE DAM OUTLET JUST NE OF CARLYLE
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 11 30 | | 1.120 | 3.900 | 0.198 | 0.030 | 0.065 |
| 73/07/08 | 08 50 | | 1.180 | 3.050 | 0.065 | 0.021 | 0.050 |
| 73/08/05 | 14 20 | | 0.430 | 1.600 | 0.062 | 0.060 | 0.135 |
| 73/09/09 | 08 40 | | 1.140 | 1.120 | 0.105 | 0.037 | 0.095 |
| 73/10/14 | 10 30 | | 1.140 | 1.150 | 0.056 | 0.040 | 0.085 |
| 73/11/03 | 10 10 | | 0.940 | 0.950 | 0.070 | 0.036 | 0.165 |
| 73/12/02 | 10 15 | | 0.630 | 0.800 | 0.015 | 0.024 | 0.070 |
| 74/01/06 | 11 00 | | 1.090 | 0.500 | 0.032 | 0.028 | 0.060 |
| 74/02/17 | 09 15 | | 1.440 | 1.500 | 0.100 | 0.090 | 0.160 |
| 74/03/03 | | | 2.640 | 1.200 | 0.055 | 0.070 | 0.160 |
| 74/03/16 | 09 50 | | 3.100 | 2.000 | 0.210 | 0.070 | 0.155 |
| 74/04/07 | 10 00 | | 3.200 | 0.800 | 0.040 | 0.050 | 0.085 |
| 74/05/04 | 09 10 | | 2.000 | 0.900 | 0.040 | 0.037 | 0.140 |

STORET RETRIEVAL DATE 75/10/23

1706A2
38 57 35.0 089 05 10.0
KASKASKIA RIVER
17 15 VANDALIA
I/LAKE CARLYLE
BRDG ON US 40 AT E EDGE OF VANDALIA
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 14 55 | | 5.200 | 0.960 | 0.060 | 0.032 | 0.120 |
| 73/07/08 | 18 10 | | 1.800 | 1.000 | 0.031 | 0.040 | 0.150 |
| 73/08/05 | 15 25 | | 3.000 | 0.980 | 0.026 | 0.038 | 0.145 |
| 73/09/09 | 09 25 | | 2.200 | 1.200 | 0.120 | 0.046 | 0.180 |
| 73/10/14 | 13 00 | | 1.800 | 0.900 | 0.070 | 0.046 | 0.165 |
| 73/11/03 | 11 45 | | 0.940 | 0.950 | 0.168 | 0.056 | 0.260 |
| 73/12/02 | 12 15 | | 2.000 | 1.000 | 0.040 | 0.024 | 0.140 |
| 74/01/06 | 14 15 | | 1.920 | 1.000 | 0.060 | 0.024 | 0.110 |
| 74/02/17 | 11 20 | | 4.500 | 1.100 | 0.095 | 0.095 | 0.175 |
| 74/03/03 | 13 30 | | 4.300 | 0.800 | 0.045 | 0.105 | 0.250 |
| 74/03/16 | 11 55 | | 4.000 | 2.350 | 0.045 | 0.080 | 0.245 |
| 74/04/07 | 11 15 | | 3.080 | 1.100 | 0.035 | 0.060 | 0.315 |
| 74/05/04 | 11 15 | | 2.000 | 1.000 | 0.050 | 0.045 | 0.125 |

STORET RETRIEVAL DATE 75/10/23

170681
38 41 30.0 089 06 00.0
E FORK KASKASKIA RIVER
17 7.5 FAIRMAN
T/LAKE CARLYLE
BRDG ON US 51 1 MI N OF FAIRMAN
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 13 05 | | 0.570 | 3.300 | 0.138 | 0.050 | 0.280 |
| 73/07/08 | 11 47 | | 0.410 | 1.650 | 0.072 | 0.081 | 0.300 |
| 73/08/05 | 16 48 | | 0.390 | 0.900 | 0.019 | 0.063 | 0.125 |
| 73/09/09 | 11 05 | | 0.350 | 1.600 | 0.078 | 0.086 | 0.410 |
| 73/10/14 | 15 00 | | 0.028 | 1.100 | 0.046 | 0.035 | 0.095 |
| 73/11/03 | 12 51 | | 0.720 | 1.500 | 0.115 | 0.198 | 0.520 |
| 73/12/02 | 13 45 | | 0.900 | 0.900 | 0.064 | 0.096 | 0.280 |
| 74/01/06 | 16 15 | | 0.750 | 0.600 | 0.092 | 0.016 | 0.095 |
| 74/02/17 | 12 25 | | 0.540 | 1.400 | 0.060 | 0.010 | 0.075 |
| 74/03/03 | 15 15 | | 0.640 | 1.700 | 0.080 | 0.050 | 0.195 |
| 74/03/16 | 12 50 | | 0.410 | 2.400 | 0.185 | 0.045 | 0.240 |
| 74/04/07 | 12 00 | | 0.350 | 1.300 | 0.057 | 0.055 | 0.230 |
| 74/05/04 | 15 20 | | 0.276 | 0.800 | 0.060 | 0.045 | 0.145 |

STORET RETRIEVAL DATE 75/10/23

1706C1
38 43 30.0 089 08 17.0
LOUSE RUN
17 7.5 BOULDER
T/LAKE CARLYLE
BRDG ON SEC RD JUST S PATOKA OIL FIELD
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 13 40 | | 1.000 | 3.440 | 0.350 | 0.120 | 0.300 |
| 73/07/08 | 11 10 | | 0.300 | 1.500 | 0.176 | 0.067 | 0.160 |
| 73/08/05 | 16 25 | | 0.013 | 1.200 | 0.034 | 0.028 | 0.120 |
| 73/09/09 | 10 55 | | 0.675 | 3.360 | 0.220 | 0.290 | 0.760 |
| 73/10/14 | 14 40 | | 0.160 | 2.700 | 0.126 | 0.075 | 0.230 |
| 73/11/03 | 12 40 | | 1.220 | 2.400 | 0.066 | 0.590 | 1.150 |
| 73/12/02 | 13 30 | | 0.640 | 1.000 | 0.068 | 0.144 | 0.144 |
| 74/01/06 | 16 00 | | 1.200 | 0.600 | 0.100 | 0.020 | 0.095 |
| 74/02/17 | 12 15 | | 0.450 | 0.400 | 0.075 | 0.020 | 0.045 |
| 74/03/03 | 15 00 | | 0.850 | 1.100 | 0.105 | 0.055 | 0.150 |
| 74/03/16 | 12 40 | | 0.910 | 2.800 | 0.140 | 0.125 | 0.400 |
| 74/04/07 | 13 35 | | 0.264 | 0.700 | 0.060 | 0.035 | 0.095 |
| 74/05/04 | 14 10 | | 0.064 | 1.800 | 0.065 | 0.035 | 0.280 |

STORET RETRIEVAL DATE 75/10/23

170601
38 45 55.0 089 07 00.0
NORTH FORK
17 15 VANDALIA
T/LAKE CARLYLE
BRDG ON SEC RD 1.5 MI NW OF PATOKA
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 14 00 | | 0.500 | 3.000 | 0.176 | 0.081 | 0.255 |
| 73/07/08 | 11 27 | | 0.480 | 1.750 | 0.100 | 0.100 | 0.265 |
| 73/08/05 | 16 07 | | 0.260 | 0.760 | | 0.092 | 0.140 |
| 73/09/09 | 10 47 | | 1.100 | 2.730 | 0.760 | 0.250 | 0.440 |
| 73/11/03 | 12 31 | | 0.189 | 1.200 | 0.054 | 0.200 | 0.370 |
| 73/12/02 | 13 15 | | 0.630 | 1.000 | 0.160 | 0.240 | 0.300 |
| 74/01/06 | 15 30 | | 1.040 | 0.900 | 0.088 | 0.032 | 0.125 |
| 74/02/17 | 12 00 | | 0.480 | 0.500 | 0.040 | 0.015 | 0.055 |
| 74/03/03 | 14 35 | | 0.730 | 0.900 | 0.055 | 0.050 | 0.185 |
| 74/03/16 | 12 50 | | 0.640 | 2.900 | 0.230 | 0.065 | 0.250 |
| 74/04/07 | 13 00 | | 0.312 | 1.200 | 0.055 | 0.050 | 0.240 |
| 74/05/04 | 15 35 | | 0.240 | 1.700 | 0.190 | 0.080 | 0.290 |

STORET RETRIEVAL DATE 75/10/23

1706E1
38 54 25.0 089 05 05.0
HICKORY CREEK
17 15 VANDALIA
T/LAKE CARLYLE
BRDG ON US 51 4 MI S OF VANDALIA
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 14 10 | | 0.420 | 2.000 | 0.120 | 0.038 | 0.120 |
| 73/07/08 | 10 28 | | 0.310 | 0.560 | 0.056 | 0.048 | 0.140 |
| 73/08/05 | 15 42 | | 0.530 | 1.320 | | 0.033 | 0.080 |
| 73/09/09 | 10 15 | | 0.147 | 0.980 | 0.183 | 0.052 | 0.135 |
| 73/10/14 | 13 30 | | 0.063 | 0.800 | J.068 | 0.070 | 0.130 |
| 73/11/03 | 11 59 | | 0.210 | 0.850 | 0.052 | 0.088 | 0.175 |
| 73/12/02 | 12 45 | | 0.900 | 0.700 | 0.052 | 0.056 | 0.175 |
| 74/01/06 | 12 45 | | 0.780 | 0.500 | 0.100 | 0.012 | 0.035 |
| 74/02/17 | 11 35 | | 0.860 | 1.500 | 0.090 | 0.030 | 0.077 |
| 74/03/03 | 14 10 | | 0.616 | 1.000 | 0.060 | 0.035 | 0.130 |
| 74/03/16 | 12 10 | | 0.504 | 4.000 | 0.100 | 0.040 | 0.240 |
| 74/04/07 | 11 30 | | 0.252 | 0.600 | 0.050 | 0.030 | 0.075 |
| 74/05/04 | 14 55 | | 0.260 | 1.700 | 0.095 | 0.050 | 0.230 |

40

STORET RETRIEVAL DATE 75/10/23

41 N

1706F1
38 56 10.0 089 05 05.0
DRAINAGE DITCH (CAMP CR)
17 15 VANDALIA
T/LAKE CARLYLE
BRDG ON US 51 2 MI S OF VANDALIA
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 14 | 50 | 0.630 | 2.730 | 0.210 | 0.044 | 0.175 |
| 73/07/08 | 10 | 20 | 0.670 | 1.600 | 0.130 | 0.050 | 0.170 |
| 73/08/05 | 15 | 37 | 0.220 | 0.540 | 0.063 | 0.035 | 0.080 |
| 73/09/09 | | | 0.300 | 1.540 | 0.147 | 0.078 | 0.320 |
| 73/10/14 | 13 | 15 | 0.016 | 0.750 | 0.066 | 0.070 | 0.230 |
| 73/11/03 | 11 | 55 | 0.064 | 0.600 | 0.060 | 0.075 | 0.260 |
| 73/12/02 | 12 | 30 | 0.800 | 0.850 | 0.084 | 0.040 | 0.158 |
| 74/01/06 | 14 | 30 | 1.180 | 0.500 | 0.100 | 0.022 | 0.100 |
| 74/02/17 | 11 | 30 | 0.790 | 1.400 | 0.050 | 0.035 | 0.055 |
| 74/03/03 | 14 | 00 | 1.260 | 1.300 | 0.050 | 0.075 | 0.430 |
| 74/03/16 | 12 | 05 | 0.950 | 1.900 | 0.090 | 0.075 | 0.315 |
| 74/04/07 | 12 | 25 | 0.820 | 1.100 | 0.095 | 0.040 | 0.210 |
| 74/05/04 | 14 | 20 | 0.176 | 1.100 | 0.080 | 0.050 | 0.240 |

STORET RETRIEVAL DATE 75/10/23

17066 1
38 52 00.0 089 15 00.0
HURRICANE CREEK
17 15 GREENVILLE
T/LAKE CARLYLE
BRDG ON SEC RD 1.25 E OF HAMBURG
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 15 50 | | 1.240 | 1.600 | 0.087 | 0.066 | 0.200 |
| 73/07/08 | 09 40 | | 1.000 | 0.910 | 0.063 | 0.053 | 0.200 |
| 73/08/05 | 15 00 | | 0.580 | 0.720 | 0.039 | 0.044 | 0.095 |
| 73/09/09 | 09 25 | | 0.480 | 2.500 | 0.082 | 0.160 | 0.720 |
| 73/10/14 | 11 30 | | 0.315 | 0.990 | 0.110 | 0.085 | 0.190 |
| 73/11/03 | 10 53 | | 0.310 | 0.480 | 0.048 | 0.070 | 0.260 |
| 73/12/02 | 11 15 | | 1.100 | 0.980 | 0.104 | 0.052 | 0.135 |
| 74/01/06 | 13 00 | | 1.120 | 0.600 | 0.108 | 0.020 | 0.113 |
| 74/02/17 | 09 55 | | 1.090 | 0.480 | 0.080 | 0.025 | 0.050 |
| 74/03/03 | 12 00 | | 1.090 | 0.600 | 0.040 | 0.040 | 0.165 |
| 74/03/16 | 11 00 | | 1.000 | 4.600 | 0.203 | 0.065 | 0.760 |
| 74/04/07 | 10 20 | | 0.830 | 0.700 | 0.070 | 0.040 | 0.095 |
| 74/05/04 | 14 50 | | 0.320 | 1.500 | 0.065 | 0.030 | 0.140 |

42k

STORET RETRIEVAL DATE 75/10/23

1706M1
38 49 00.0 089 06 20.0
FLAT CREEK
17 15 VANDALIA
T/LAKE CARLYLE
BRDG ON SEC RD 1.5 MI NW OF VERNON
11EPALES 2111204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P |
|---|---|---|---|---|---|---|---|
| 73/06/02 | 14 15 | | 0.315 | 2.500 | 0.105 | 0.042 | 0.150 |
| 73/07/08 | 10 35 | | 0.510 | 1.800 | 0.126 | 0.060 | 0.210 |
| 73/08/05 | 15 52 | | 0.028 | 1.760 | | 0.067 | 0.220 |
| 73/09/09 | 10 24 | | 0.126 | 2.310 | 0.510 | 0.073 | 0.405 |
| 73/10/14 | 14 00 | | 0.063 | 2.800 | 0.730 | 0.370 | 0.700 |
| 73/11/03 | 12 14 | | 0.160 | 1.150 | 0.054 | 0.145 | 0.420 |
| 73/12/02 | 13 10 | | 0.560 | 1.000 | 0.080 | 0.108 | 0.108 |
| 74/02/17 | 11 45 | | 0.740 | 1.400 | 0.040 | 0.020 | 0.315 |
| 74/03/03 | 14 20 | | 0.860 | 1.800 | 0.175 | 0.060 | 0.155 |
| 74/03/16 | 12 15 | | 0.950 | 3.100 | 0.195 | 0.105 | 0.290 |
| 74/04/07 | 16 00 | | 0.830 | 1.100 | 0.095 | 0.040 | 0.220 |
| 74/05/04 | 14 35 | | 0.800 | 1.000 | 0.055 | 0.025 | 0.085 |

STORET RETRIEVAL DATE 75/10/23

1706AA TF1706AA P001000
39 00 40.0 089 05 40.0
ILLINOIS STAE FARM
17 15 RAMSEY
T/LAKE CARLYLE
KASKAKIA RIVER
11EPALES 2141204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P | 50051 FLOW RATE INST MGD | 50053 CONDUIT FLOW-MGD MONTHLY |
|---|---|---|---|---|---|---|---|---|---|
| 73/07/12 | 06 00 | | | | | | | | |
| CP(T)- | | | 9.200 | 2.900 | 1.100 | 4.950 | 5.300 | 0.121 | 0.120 |
| 73/07/12 | 13 00 | | | | | | | | |
| 73/08/01 | 06 00 | | | | | | | | |
| CP(T)- | | | 5.900 | 2.100 | 0.210 | 3.800 | 4.900 | 0.114 | 0.120 |
| 73/08/01 | 14 00 | | | | | | | | |
| 73/09/05 | 06 00 | | | | | | | | |
| CP(T)- | | | 7.200 | 2.770 | | | | 0.120 | 0.120 |
| 73/09/05 | 14 00 | | | | | | | | |
| 73/10/02 | 06 00 | | | | | | | | |
| CP(T)- | | | 10.600 | 1.700 | 0.400 | 5.800 | 5.800 | 0.120 | 0.120 |
| 73/10/02 | 14 00 | | | | | | | | |
| 73/11/01 | 06 00 | | | | | | | | |
| CP(T)- | | | 9.800 | 3.900 | 0.210 | 5.750 | 6.800 | 0.100 | 0.110 |
| 73/11/01 | 14 00 | | | | | | | | |
| 73/12/04 | 06 00 | | | | | | | | |
| CP(T)- | | | 8.200 | 3.600 | 0.700 | 4.400 | 5.100 | 0.119 | 0.114 |
| 73/12/04 | 14 00 | | | | | | | | |
| 74/01/03 | 06 00 | | | | | | | | |
| CP(T)- | | | 6.400 | 9.100 | 1.160 | 5.400 | 7.500 | 0.120 | 0.120 |
| 74/01/03 | 14 00 | | | | | | | | |
| 74/02/05 | 06 00 | | | | | | | | |
| CP(T)- | | | 5.400 | 6.400 | 0.080 | 4.500 | 5.250 | 0.120 | 0.120 |
| 74/02/05 | 14 00 | | | | | | | | |
| 74/03/06 | 06 00 | | | | | | | | |
| CP(T)- | | | 5.800 | 4.900 | 0.197 | 5.050 | | 0.120 | 0.120 |
| 74/03/06 | 14 00 | | | | | | | | |
| 74/04/03 | 06 00 | | | | | | | | |
| CP(T)- | | | 7.200 | 2.600 | 0.170 | 4.600 | 5.350 | 0.120 | 0.120 |
| 74/04/03 | 14 00 | | | | | | | | |
| 74/05/01 | 06 00 | | | | | | | | |
| CP(T)- | | | 8.600 | 4.400 | 0.170 | 5.750 | 6.400 | 0.120 | 0.120 |
| 74/05/01 | 14 00 | | | | | | | | |
| 74/06/04 | 06 00 | | | | | | | | |
| CP(T)- | | | 6.800 | 2.850 | 0.140 | 5.750 | 6.031 | 0.130 | 0.125 |
| 74/06/04 | 14 00 | | | | | | | | |

44

STORET RETRIEVAL DATE 75/10/23

1706AA TF1706AA P001000
39 00 40.0 089 05 48.0
ILLINOIS STAE FARM
17 15 RAMSEY
T/LAKE CARLYLE
KASKAKIA RIVER
11EPALES 21-1204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P | 50051 FLOW RATE INST MGD | 50053 CONDUIT FLOW-MGD MONTHLY |
|---|---|---|---|---|---|---|---|---|---|
| 74/07/01 | 06 00 | | | | | | | | |
| CP(T)- | | | 7.700 | 2.100 | 0.270 | 5.000 | 5.200 | 0.135 | 0.135 |
| 74/07/01 | 14 00 | | | | | | | | |

STORET RETRIEVAL DATE 75/10/23

1706XA PD1706XA P000700
38 46 00.0 088 51 00.0
KINHUNDY
17 1S KINHUNDY
T/CARLYLE
EAST FORK
11EPALES 2141204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P | 50051 FLOW RATE INST MGD | 50053 CONDUIT FLOW-MGD MONTHLY |
|---|---|---|---|---|---|---|---|---|---|
| 74/04/23 | 10 00 | | 0.320 | 3.700 | 0.310 | 1.300 | 2.200 | | |
| 74/06/26 | 14 30 | | 0.320 | 7.300 | 0.230 | 0.290 | 1.400 | | |
| 74/07/29 | 13 30 | | 0.160 | 9.700 | 0.530 | 0.240 | 0.730 | 0.006 | 0.006 |
| 74/08/28 | 13 30 | | 0.510 | 2.000 | 0.130 | | 0.700 | 0.006 | 0.006 |
| 74/09/24 | 14 45 | | 1.760 | 2.700 | 0.200 | 0.310 | 0.820 | | 0.060 |
| 74/10/29 | 14 30 | | 0.160 | 3.500 | 0.250 | 0.535 | 1.200 | 0.060 | 0.060 |
| 74/11/29 | 14 00 | | 0.880 | 4.300 | 0.190 | 1.950 | 2.350 | 0.006 | |
| 75/01/06 | 14 30 | | 1.360 | 6.500 | 0.160 | 2.150 | 2.500 | | 0.006 |
| 75/01/28 | 13 00 | | 1.120 | 2.200 | 0.100 | 0.100 | 0.300 | | 0.060 |
| 75/02/25 | 13 30 | | 0.960 | 3.200 | | 0.885 | 1.200 | | 0.060 |
| 75/03/25 | 14 00 | | 0.480 | 1.000K | 0.220 | 0.370 | 0.600 | 0.006 | |
| 75/04/22 | 13 00 | | 0.550 | 3.800 | 0.160 | 1.150 | 1.800 | | 0.060 |
| 75/05/22 | 12 45 | | 0.500 | 6.000 | 0.060 | 0.450 | 1.600 | | 0.006 |

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/23

170641 SF170641 P000117
38 39 20.0 089 15 59.0
COLES CREEK ACCESS AREA
17027 7.5 KEYESPORT
D/CARLYLE LAKE
CARLYLE LAKE
11EPALES 2141204
4 0000 FEET DEPTH

| DATE FROM TO | TIME OF DAY | DEPTH FEET | 00630 NO2&NO3 N-TOTAL MG/L | 00625 TOT KJEL N MG/L | 00610 NH3-N TOTAL MG/L | 00671 PHOS-DIS ORTHO MG/L P | 00665 PHOS-TOT MG/L P | 50051 FLOW RATE INST MGD | 50053 CONDUIT FLOW-MGD MONTHLY |
|---|---|---|---|---|---|---|---|---|---|
| 73/09/28 | 11 00 | | | | | | | | |
| CP(T)- | | | 19.400 | 11.500 | 6.300 | 1.470 | 1.500 | 0.004 | 0.002 |
| 73/09/28 | 16 00 | | | | | | | | |
| 73/10/31 | 11 00 | | | | | | | | |
| CP(T)- | | | 27.000 | | 0.054 | 2.400 | 2.800 | 0.003 | 0.002 |
| 73/10/31 | 16 00 | | | | | | | | |
| 73/11/30 | 11 00 | | | | | | | | |
| CP(T)- | | | 5.700 | 0.500 | 0.025 | 1.350 | 1.500 | 0.002 | 0.001 |
| 73/11/30 | 16 00 | | | | | | | | |
| 74/06/03 | 09 00 | | | | | | | | |
| CP(T)- | | | 19.000 | 14.000 | 3.200 | 3.900 | 3.900 | 0.001 | 0.005 |
| 74/06/03 | 14 00 | | | | | | | | |
| 74/06/26 | 10 00 | | | | | | | | |
| CP(T)- | | | 11.000 | 1.500 | 0.020 | 1.780 | 1.850 | 0.001 | 0.005 |
| 74/06/26 | 15 00 | | | | | | | | |
| 74/07/31 | 09 00 | | | | | | | | |
| CP(T)- | | | 19.000 | 1.400 | 0.050K | 4.200 | 4.300 | 0.002 | 0.005 |
| 74/07/31 | 14 00 | | | | | | | | |
| 74/08/27 | 09 00 | | | | | | | | |
| CP(T)- | | | 7.200 | 1.200 | 0.050K | | 6.200 | 0.001 | 0.003 |
| 74/08/27 | 14 00 | | | | | | | | |
| 74/09/30 | 09 00 | | | | | | | | |
| CP(T)- | | | | 1.000K | 0.025 | 7.600 | 7.600 | 0.0004 | 0.001 |
| 74/09/30 | 14 00 | | | | | | | | |
| 74/10/30 | 09 00 | | | | | | | | |
| CP(T)- | | | 49.000 | 2.000 | 0.220 | 5.800 | 6.000 | 0.0003 | 0.001 |
| 74/10/30 | 14 00 | | | | | | | | |

K VALUE KNOWN TO BE
LESS THAN INDICATED